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ABSTRACT

This teacher's guide contains resources to facilitate the study of the world food situation in home economics classes. It provides terms, historical elements of famine, and the effects of hunger and dietary deficiency on humans. Brief overviews of the basic factors influencing the world food situation and some of the proposed measures to solve the problems are also presented. The guide contains a list of objectives (e.g., describe seven effects of hunger on humans), suggested activities for instructor and student, and instructional materials (information sheets, e.g., terms and definitions; influences on the world food situation), transparency masters (e.g., food supply-demand balance), assignment sheets (e.g., nutritional deficiencies and diseases), tests (matching and essay), and answer key. The guide also includes a list of reference books and audiovisual materials. (CT)

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WORLD FOODS
CAN THE WORLD FEED US?

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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PREFACE

The semester course "world foods" which is currently included in vocational consumer homemaking curriculums, contains many diverse and complex ideas. Each of the available instructional units that relates to "world foods" represents only one facet of the total semester course. Since no curriculum guide on "world foods" is as yet available, the following conceptual outline has been included with this unit.

The outline was revised, developed and analyzed by vocational home economics teachers, subject matter specialists, Department of Elementary and Secondary Education staff and University of Missouri-Columbia Home Economics Education staff.

A single instructional unit on "world foods" cannot encompass the breadth of the total course. Therefore, the topical outline is included to clarify instructional concepts that need to be expanded upon within the semester course.

Teachers will need to develop additional content and resource materials to supplement existing instructional units. In that way students will be exposed to the fullest range of ideas applicable to the semester course and concepts will be logically organized around available instructional units.

WORLD FOODS CONCEPTUAL OUTLINE

MAJOR CONCEPT I IMPLICATION OF WORLD FOODS

A. Nutritional Status of World Population

1. Overnutrition
2. Undernutrition

B. World Food Policies

1. Agricultural Reporting Systems
2. Research Supported Policies
3. Food Supplies
4. Ecology

C. Organizations Participating in Universal Health Programs

MAJOR CONCEPT II INTERNATIONAL AND REGIONAL FOODS

A. Cultural and Food Patterns

1. Political
2. Social
3. Economic
4. Geography
5. Religion
6. Production and Processing

B. Food Planning and Preparation

1. Recognition
2. Selection
3. Storage
4. Preparation
5. Measurements (Metric, English)
6. Preservation
7. Equipment and Use of Available Resources
8. Dining Out and Etiquette

MAJOR CONCEPT III CAREERS IN WORLD FOOD AND NUTRITION

A. Career Development

B. Opportunities

C. Qualifications

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FOREWORD

Food is one of our most basic and important needs. However, the capacity to produce food varies drastically around the world. Sharp contrasts are found in different areas with starvation in some areas and surpluses in others. Industrialism has nearly eliminated self-sufficiency in food production. Food for the world has become one of the highest-ranking moral issues that concerns nations and their people.

The world food situation is vastly complex and interrelated. Both the affects and effects of the world food situation are interwoven with political, social, cultural, religious, economic and physical factors. A knowledge of these interrelationships and factors is necessary in order to understand and assess the current world food situation.

This packet is designed as a resource to facilitate the study of the world food situation in home economics classes. The materials included in this packet briefly introduce terms, historical elements of famine and the effects of hunger and dietary deficiency on humans. Brief overviews of the basic factors influencing the world food situation and some of the proposed measures to solve the problems are also presented.

"A hungry man is not a free man."
--Adlai Stevenson, 1952.

"Every man, woman and child has the inalienable right to be free from hunger and malnutrition . . . The eradication of hunger is the common objective of all countries of the international community."
--Delegates World Food Conference, 1974.

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UNIT OBJECTIVE

After completion of this unit, the participant should be able to define terms related to the world food situation, to identify the historical elements of famine and the effects of hunger and dietary deficiencies on humans, to describe the major elements and interrelationships of the world food situation and to understand some of the proposed measures to improve this situation.

SPECIFIC OBJECTIVES

After completion of this unit, the participant should be able to:

1. Match terms associated with the world food situation with their correct definitions.

2. Trace famine through history including identification of the first known famine, one of the most well-known famines and at least one example of famine in the last few years.

3. Identify three ways in which famines differ from periods of scarcity.

4. Describe seven effects of hunger on humans.

5. Match deficiency diseases with their causes and characteristics.

6. Specify, in a short essay, the five major factors causing the current world food situation and include two specific points under each of the major factors.

7. Define the Malthusian theory of population including two of its major points.

8. Describe three changing situations in the United States and other developed countries that affect the world food situation.

9. Describe three problems in developing countries that affect the world food situation.

10. List the three arguments in favor of vegetarianism and four arguments in favor of livestock production as the means for meeting world demands for food.

11. In a short paragraph, state five suggestions for helping to improve the world food situation.

CAN THE WORLD FEED US?

SUGGESTED ACTIVITIES

I. Instructor

- A. Provide student with objectives
- B. Provide student with information outline and assignment sheets
- C. Review unit and specific objectives
- D. Review information and assignment sheets
- E. Make transparencies
- F. Direct student through assignment sheets
- G. Evaluate assignment sheets
- H. Give test

II. Student

- A. Read objectives
- B. Study information sheet
- C. Complete the assignment sheets
- D. Take test

INSTRUCTIONAL MATERIALS

I. Included in this unit

- A. Objectives
- B. Information sheet
- C. Transparency masters
  1. TM-I-1: Food Supply-Demand Balance
  2. TM-I-2: Billions of U.S. Dollars
  3. TM-I-3: Malthusian Theory of Population

4. TM-I-4: The "Population Explosion"

5. TM-I-5: The "Population Explosion" continued

6. TM-I-6: Grain Protein Conversion of Livestock

D. Assignment sheets

1. Assignment Sheet #1: Nutritional Deficiencies and Diseases

2. Assignment Sheet #2: Word Search

3. Assignment Sheet #3: Interpreting Population Figures

4. Assignment Sheet #4: Class World Food Conference Project

E. Answers to assignment sheets

F. Test

G. Answers to test

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CAN THE WORLD FEED US?

INFORMATION SHEET

I. Terms and definitions

A. Agrarian--Pertains to the use of land for farming or agriculture.

B. Calorie--A unit of heat measurement or energy value of food used by the body.

C. Cereals--Edible grains such as wheat, oats or rice.

D. Commodity--Anything which is useful and refers especially to the economic usefulness or value of agricultural or mineral products.

E. Demographic--Describes the characteristics of births, deaths and diseases or similar vital social statistics.

F. Developed Countries--Countries or areas described as developed have advanced industry and technology with a centrally planned economy and a higher level of living such as in North America, U.S.S.R., Australia, New Zealand, Eastern Europe, United Kingdom and Japan.

(NOTE: No sharp line divides developed and developing countries.)

G. Developing Countries--Countries or areas described as developing have limited industry and technology with little economic growth and planning, and they generally have a lower level of living such as in South America, Mexico, Latin America, Western Asia, China, Eastern Asia, Southeast Asia and North Africa.

(NOTE: They were formerly called underdeveloped or less developed countries.)

H. Distribution--Pertains to delivering, spreading out, portioning or diffusion of some product.

I. Famine--Describes a period of scarcity in several ways, but it usually describes the general, acute, widespread and extreme shortage of food within a region which is not relieved by adequate distribution of food supplies imported into the region.

J. Hunger--Refers to the human condition of misery, suffering and pain caused from the prolonged lack of food.

(NOTE: Sometimes the term hunger is used synonymously with undernutrition.)

K. Green Revolution--Describes the recent spectacular progress made in increasing the yields of wheat, rice and maize in several of the most populous Southeast Asian countries.

L. Malnutrition--Describes the inadequacy of the nutritional quality of the diet and the deficiency of such essential nutrients as protein, minerals or vitamins.

M. Millennia or Millennium--Describes the span of a thousand years or sometimes used to describe periods of great happiness or peace.

N. Nourishment--That which supports life and growth in a living organism.

O. Nutrition--The science of dealing with the use of food and the nourishment of the body.

P. Per capita--A measure per person.

Q. Population Control--Relates to the efforts to lower the birthrate.

R. Pestilence--Describes any contagious or infectious disease that is usually fatal and often epidemic.

S. Ruminants--Animals which have a stomach with four compartments and chew a cud such as cows, sheep, goats, buffalo, camel and deer.

T. Technology--The application of science to achieve industrial and commercial objectives or progress.

U. Triage--A system of deciding rationally who will be saved when it is clear that not everyone can be and it implies that all compassionate measures have already been taken.

V. Undernutrition--Describes the inadequate absorption of nutrients into the body system due to insufficient intake of food.

(NOTE: Undernutrition and malnutrition are not mutually exclusive since people who are undernourished may also be malnourished.)

W. Zero Population Growth (ZPG)--The limiting of population increase to the number of live births needed to replace the existing population.

II. Famines have occurred throughout history.

A. The earliest written reference to famine occurred in 3500 B.C. in Egypt.

B. Asia has always been particularly vulnerable to famine.

1. Asia's rice crops support one of the largest and densest populations on earth.

2. Crops are grown in areas within the monsoon belt where rainfall is unreliable and variable.

3. Asia, with more than half of the world's people, is one of the areas most vulnerable to famine caused by natural catastrophe.

C. The "Potato Famine" in Ireland in 1846-1851 is one of the most well-known famines.

1. Potato blight disease caused failure of the basic food crop.

2. The cultivation of the potato supported the rapidly growing Irish population.

3. An estimated 1.5 million people starved to death and large-scale emigration to the United States followed.

D. Famines resulting from civil wars have occurred in the last few years.

1. Several hundred thousand people died of starvation in Biafra in 1969-1970 during the Nigerian Civil War.

2. During the Pakistani Civil War, resulting in the establishment of Bangladesh, thousands died from disease and starvation.

3. In the summer of 1974, several thousand people died in West Africa and Ethiopia from famine caused by several years of drought.

III. Famines differ from periods of scarcity in several ways.

A. A famine is a general, acute or extreme shortage of food within a region or particular geographic locale which is not relieved because of inadequate distribution or imports of food supplies.

(NOTE: Scarcity refers to more short-term insufficiencies which can be remedied by redistribution or imports.)

B. Famines cause mass starvation, diseases and deaths.

C. Famines are usually sudden, with a sharp reduction in the food supply.

IV. The effects of hunger are variable.

A. The failure to grow normally or thrive is a sensitive indicator of undernourishment in children.

(NOTE: Even if children grow in spite of the hunger, they grow more slowly and are smaller than well-nourished children of the same age.)

B. Body composition changes during hunger: there is a loss of fat and protein from the body, an accumulation of water, and bones become more fragile.

C. Fertility does not appear to be impaired or reduced by undernutrition but the babies of undernourished mothers generally are smaller in size.

D. Hunger lessens the work capacity or physical strength and endurance.

E. Hunger increases the susceptibility and occurrence of infection and disease.

F. Hunger causes changes in social behavior and personality adjustment with increased depression and other serious personality disorders.

G. Hunger adversely affects mental development.

1. Maternal malnutrition can limit both the number and size of the child's brain cells.

2. Since the brain and nervous system achieve approximately 80 percent of the total growth in the first four years of life, malnutrition can seriously inhibit normal mental development.

V. The prolonged lack of food and certain nutrients in the diet causes illness and nutritional deficiency diseases.

A. Anemia is a condition in which the blood is deficient in red corpuscles or hemoglobin or both.

(NOTE: Sometimes the term is used to describe weakness, listlessness or a lack of energy.)

1. It may be caused by a lack of enough iron and high-quality protein in the diet.

2. Another type of anemia is found where vitamin C and one of the B vitamins (folacin) are lacking in the diet.

B. Ariboflavinosis is caused by a lack of riboflavin and is characterized by tissue changes in the tongue, mucous membranes of the lips and mouth, and the skin around the base of the nose.

C. Beriberi is a disease which affects the nervous tissues of the body and is caused by a deficiency of thiamine, one of the B vitamins.

1. It is prevalent where white rice is practically the only food in the diet.

2. It is characterized by edema (a swelling caused by too much fluid in the tissues), pain and the loss of the use of the limbs.

D. Endemic goiter is caused primarily from a lack of iodine in the diet.

1. Goiter is characterized by a swelling of the thyroid gland in the front part of the neck.

2. Goiter occurs in some parts of almost every region of the world and in almost all groups of people.

E. Kwashiorkor is a severe form of protein-calorie malnutrition.

1. The disease is characterized by retarded growth, edema, muscle wasting, changes in the hair and coloring of the skin, rash or skin lesions, enlarged liver and even changes in behavior.

2. It is one of the greatest threats to the good health of the world's children.

F. Marasmus is a partial starvation or a gross and chronic calorie deficiency characterized by wasting muscles and a shriveled or old-looking face.

G. Osteomalacia is a deficiency of vitamin D or calcium and phosphorus which is sometimes called "adult rickets," and it is characterized by a softening of the bones.

(NOTE: Vitamin D is necessary so that the body can use minerals, calcium and phosphorus for normal bones.)

H. Pellagra is a niacin deficiency disease.

1. It is characterized by skin eruptions, digestive and nervous disturbances, and eventually mental deterioration.

2. It occurs primarily where people use corn (maize) as a staple in the diet with the absences of meat, fish or other whole-grain cereals.

3. It is still a problem in parts of Africa, India, Egypt, Portugal, Latin America and Yugoslavia.

I. Rickets is a deficiency disease resulting from a lack of vitamin D and insufficient exposure to sunlight.

1. It is characterized by defective bone growth, usually bowed legs, occurring chiefly in children.

2. It is found in areas where there is little sunlight or where social customs indicate that children be kept indoors or covered to shield them from the sun.

J. Scurvy is a disease caused from a deficiency of vitamin C or ascorbic acid usually resulting from the absence of fresh fruits and vegetables in the diet.

1. Spongy, bleeding gums, bleeding under the skin and extreme weakness characterize the disease.

2. It is mostly seen in the drought and famine areas of the arid countries of the Near East.

K. Xerophthalmia is a disease caused from a deficiency of vitamin A.

1. In its most severe form, it involves a drying of the membranes of the eye, ultimately leading to blindness.

2. It is found in Latin America, the Middle East, Ceylon, Burma, South India, Malaya and Indonesia.

3. The mortality rate of children with the disease is very high, making it one of the world's most serious health problems.

VI. The most basic influences on the world food situation are population growth, environmental conditions and food production and distribution systems.

A. The population variable is perhaps the most important factor influencing the world food situation.

1. Population growth continues to increase at a faster rate than food production, straining the capacity of the world to provide adequate food supplies.

   a. There are differences in the rate of population growth in developing and developed countries with two-thirds of the world's population currently living in developing countries.
   b. If current trends continue, three-fourths of the world's population will live in developing countries by 1985.
   c. By the year 2,000, the world's population is projected to rise to 7 or 8 billion.
   d. Even if zero population growth goals were attained, the world's population would still increase because of such factors as greater life expectancy and the proportion of the population at reproduction age.

   (NOTE: In many developing countries the largest proportion of the population will soon be or currently are of childbearing age, thus increasing birthrate and population growth drastically.)

2. In 1975, the world's population was growing by about 2 percent each year, which is approximately twice the rate it was in 1950.

   a. Growth patterns differ for developed and developing countries.
   b. In the mid-70's the growth rate for developed countries was about 1 percent annually and in developing countries more than 2.5 percent yearly.

3. Although in developing countries the proportion of undernourished population has declined, the absolute number of hungry people has increased.

4. Population growth also contributes to the increasing levels of pollution and excessive crowding.

B. Weather and climatic changes probably have the greatest impact on food production in any one region or area.

1. Climate is unpredictable, thus requiring large reserve stocks of food to provide safety from crop failure due to weather.

2. The uncertainty of climate and weather influences the world's food supply in that:

   a. There is the possiblity of long-range changes in climate, and
   b. There is the uncertainty of year-to-year variations in weather, causing shifts in crop production locally or regionally.

3. Some meteorologists speculate that there are long-range changes in the world's climate, weather and rainfall that could affect food production.

   a. They note observations and evidence that major changes in the global climate have occurred in past eras.
   b. They note long-range changes in the temperature in the major food production areas of the northern hemisphere from the late 1800's to the mid-1970's.
   c. They note evidence of climatic changes from the dumping of wastes and pollutants into the atmosphere.

4. Modern agricultural methods, which produce the bulk of the world's food supply, are more vulnerable to weather changes and extremes for several reasons.

   a. The more intensive use of land makes production vulnerable to local changes in climate and weather.
   b. There is more farming of marginal lands which need stable climatic and weather conditions.
   c. Some crops, especially new high-yield varieties, are bred to fit specific climatic and weather conditions.

C. Agricultural production is affected by the availability of fertilizers, pesticides and technological developments.

1. Chemical fertilizers and pesticides can be used to increase the food production and their use has increased approximately fivefold from 1970 to 1975.

2. Chemical fertilizers and pesticides may not be the best solution since they are made from large quantities of petroleum products and their prices have increased drastically due to the short supplies and the energy crisis.

3. Irrigation, mechanization and new agricultural methods are other technical improvements that can affect food production.

4. Higher food prices result from increases in the cost of production and transportation.

   a. In 1971 the world price for a ton of commercial fertilizer was approximately $40 and by 1974, just three years later, the price had risen to $360.
   b. Increasing petroleum prices also cause the transportation and storage of food to be more expensive.
   c. There also have been drastic increases in the cost of modern agricultural food production and processing equipment.

5. The availability of low-priced fertilizer was a critical element in the Green Revolution.

6. Chemical fertilizers require large amounts of water to increase food production effectively and moisture is limited in many areas where food supplies are the most critically limited.

D. There is an inequitable distribution of resources in the world, including the resources of food and the resources needed to produce food.

1. Many of the technological advances which can increase food production require investments of large and expensive equipment, costly petroleum products and the knowledge and skill to operate them.

   a. Many of the small farmers in the developing countries lack the capital to invest and the knowledge and skill with which to operate modern agricultural equipment.
   b. Cultural changes are required before the small farmers in the developing countries can change their values from producing food only for their family's consumption to production of food for sale or for other people.

2. Food and petroleum are examples of economic resources used in world trade and exchange. A country's economy and development can be harmed if the balance of payments is upset by imports that are more costly than income from exports.

E. There are many challenges to overcome in distributing large stocks of food from producers to the areas of the world where it is needed.

1. Food distribution systems, including the facilities that are needed for transportation, storing, processing and distribution to the people, are still inadequate in many of the developing countries.

2. Technology and facilities are needed for proper storage, transportation and distribution of food imports so that the food does not spoil before it reaches its intended consumer.

3. In some areas it has been reported that rats eat up to 30 percent of the food, and other reports indicate almost total rotting of grains on ships due to improper storage.

4. Storage and transportation of food add to its cost; for example, storing grain adds an additional 10 to 15 percent to its market cost or value.

VII. In the late 1700's the British clergyman, sociologist and economist, Thomas Robert Malthus, warned of the dangers of population growth in his *Essay on Population,* which has become popularly known as Malthusian theory.

A. Malthus believed that the world's population tended to increase faster than the food supply, thus keeping the bulk of the population on the verge of starvation or subsistence.

1. He showed that unrestrained population growth increased in geometric proportions or progressions or from 2 to 4 to 8 to 16 to 32, etc.

2. He also indicated that the food supply increased in arithmetic progression from 2 to 3 to 4 to 5 to 6 etc.

B. Malthus pointed out two sets of checks or restraints that can control the total population.

1. *Natural* checks include starvation, disease or pestilence, and war, which all are natural outgrowths of population pressure on the food supply and serve to limit the size of the total population.

2. *Positive* restraints are those which we cause to limit the population by means of celibacy, late marriage or birth control.

VIII. The role of the United States and other developed countries in the world food situation is changing because our own situations are changing.

INFORMATION SHEET

A. In the past, imbalances between food production and a rapidly growing population in the developing countries had been largely met by huge imports from the large stockpiles in the United States.

1. Between the mid-1930's and the early 1970's the United States held huge stockpiles of grain which it had acquired under price support programs.

2. The problem then was how to get rid of the accumulated surplus.

3. a. The Food for Peace program, instituted in 1954, moved several million tons of food to the poor countries of the world.
   b. Food shipments were also sent to India when the rain and the crops failed in the mid-1960's.
   c. Food surpluses were also sent to schools and to the needy.

B. Stockpiles were depleted in 1972-1973 when the crops failed in many major countries.

1. Many of the countries rushed to buy the U. S. stockpiles of grain and suddenly stockpiles were gone.

2. No large stockpiles have been acquired since.

C. Several other factors within the U. S. have placed an increased demand on U. S. food production.

1. The population within the U. S. is growing although not as fast as previously.

2. There has been a sharp decrease in the farm population with increases in the non-farm and urban populations.

   a. A larger proportion of youth are leaving the farms and moving to the cities.
   b. Older farmers who are fewer in number are required to produce more food for the expanding urban population.
   c. Urbanization takes cultivatable land out of food production and transforms it into suburbs.

D. Consumption patterns in developed countries, especially of grain and livestock, can significantly influence the total world food supply.

1. Increased consumption of grain-fed animal products in developed and more affluent countries could cause shortages of grain for human consumption in developing countries.

   (NOTE: People in the U. S. now spend less of their total income for food and yet spend more dollars in high-quality meats and conveniences than ever before in history.)

2. Large quantities of grain are required to produce meats, especially beef.

3. Animal proteins are higher quality proteins than cereals proteins such as beans, peas and lentils.

E. Agriculture plays a central role in the economy and is sensitive to changes in the economy and prices.

1. Rising prices in materials and technology increase the cost of food whether consumed in the U. S. or exported.

2. Agriculture and food production provides jobs not only in farming, but also in financing, processing, storing, shipping and trading.

IX. The developing countries will have to overcome many problems before they can begin to provide for their own food needs.

A. Rapid population growth is the greatest problem in developing countries.

1. Population growth has been increasing much faster in the developing countries than in other parts of the world.

2. Providing contraceptives and birth control information has a limited value in many of the countries where there are social and religious values emphasizing large families and fertility.

B. Increasing production by technological advances is a complicated and slow process.

1. It requires a diffusion of knowledge and training.

2. Much of the agricultural technology introduced into the developing countries is best suited to the 12-15 percent of the world's land that is irrigated or has abundant moisture.

C. Some additional land can be made available for production by improving land and water resources such as land clearing, leveling, drainage, irrigation and flood control.

D. The majority of the farmers in the developing countries are small farmers who need limited technology that is within their resources and ability to apply and manage.

1. Equipment cannot be costly or require large investments.

2. Farmers cannot rely on costly petroleum products.

3. Where there are land tenure arrangements, incentives for better production and increased yields are needed.

4. Farmers need capital to increase agricultural production.

5. Farmers need knowledge of new agricultural methods and how to adapt these new methods to the particular local conditions.

X. In searches for solutions to the world food situation, there has been considerable debate on the use of grains or cereals for human consumption versus grains to feed livestock for food.

(NOTE: This issue has been called the "bread alone," "vegetarian" or "food and feed" issue.)

A. Over the years people in the developed countries have been meat eaters while the populace of developing countries tended to be vegetarians.

B. Those who favor the direct consumption of grain and cereals focus on their supporting arguments.

1. Larger numbers of people can be fed if a given quantity of grain is eaten directly by humans than if it is fed to livestock.

a. Estimates are that as many as 5 times the people can be fed on vegetarian diets than if the grain is eaten indirectly in the various forms of livestock products.
b. About one-half of the nutrients consumed by animals goes for the maintenance of the animal's body and not for the production of edible livestock products for human consumption.

c. Many people in densely populated areas of the world have existed as vegetarians, primarily for religious reasons.

2. It is less efficient to feed grain to animals and then use livestock products for human food than it is to feed the grain to humans directly.

   a. Animals can use as much as 16 pounds of grain to produce a pound of meat.

      (NOTE: See chart on protein conversions, TM-I-6.)

   b. In developing countries most of the grain is eaten directly by people and little is converted to animal products.
   c. Generally, when incomes rise, people tend to eat more expensive animal products such as meat, milk and eggs.
   d. Per capita grain requirements continue to increase in many nations of the world.

3. A vegetarian diet can be a healthy diet, although it requires careful planning and an in-depth knowledge of nutrition.

   a. Cereal proteins are incomplete in some of the essential amino acids and thus called low-quality proteins, whereas animal protein has all the essential amino acids and is called high-quality protein.
   b. Certain combinations of cereal proteins and their amino acids can be used to produce high-quality protein foods or dishes.

C. On the other side of the debate, those favoring animal production of food note that even if grain feeding were reduced or eliminated, livestock would remain an important source of food.

1. Livestock can utilize vast areas of grazing lands where high-yield crops cannot be grown.

2. Poultry and livestock, especially the ruminants, consume fibrous feeds (roughages), wastes and byproducts for food which would not be suitable for human consumption and otherwise wasted.

3. Plant and animal roles in world agriculture are traditionally complementary and interdependent.

   a. Animals provide needed power to pull plows and other equipment where coal oil or water power is not available and in short supply.

(NOTE: Animals such as cattle and water buffalo can be used for work, milk and meat.)

b. Animals, by providing manure for fertilizer, maintain soil fertility and extend the supply of petroleum used in chemical fertilizers.
c. Animals provide more flexibility and stability to the year-to-year grain supplies.

(NOTE: When grain crops fail because of short-term climatic and weather changes, animals can be maintained on roughages and used for food.)

d. Ruminants can convert nonprotein nitrogen to produce protein in the form of meat and milk for people.

4. Animal foods are of high nutritional quality, provide needed nutrients and are an efficient means of improving human diets.

a. Meat, dairy products and eggs are good sources of high-quality protein and vitamin B_{12}.
b. Animal foods can also be good sources of minerals and other vitamins, especially calcium and phosphorus.

XI. The world food situation can be improved by several measures.

A. Protein in the diet can be increased or supplemented.

1. Incaparina was developed in Central America as a protein-rich, low-cost supplement similar to common beverages in the diet.

2. Multi-purpose food (MPF) is a mixture that is approximately 50% protein which has been used primarily by independent relief organizations.

3. Oilseed protein is processed meal from soya, peanuts, cotton, sesame and sunflower oil production which contains 40 to 50% of good-quality protein for human consumption.

4. Single-cell proteins such as yeast and algae can be processed and used as a protein supplement.

5. Textured vegetable protein is sometimes referred to as synthesized meat but it can be made into many forms of common foods at a much lower cost.

B. High-yield and hearty varieties of grains can be developed and grown in many parts of the world.

C. Production of animal species such as beef and dairy cattle and sheep, which can be fed roughages and humanly inedible feeds, could be increased.

(NOTE: Poultry and swine often are fed humanly edible grains and would be less useful unless they were utilized as scavengers.)

D. The use of manure for fertilizer could be increased.

E. Foods from the sea can be cultivated.

1. Fish flour and fish protein concentrate are excellent sources of protein and minerals.

2. There are still many international procedures and rights to be settled over the question of who owns the seas.

F. Food aid offers some limited help.

1. The United States has been carrying on the largest food aid program in the history of the world.

2. The amount of food that would be needed to bring all the undernourished people of the world to an adequate diet would be tremendous and would be too costly and beyond the capability of almost any country in the world.

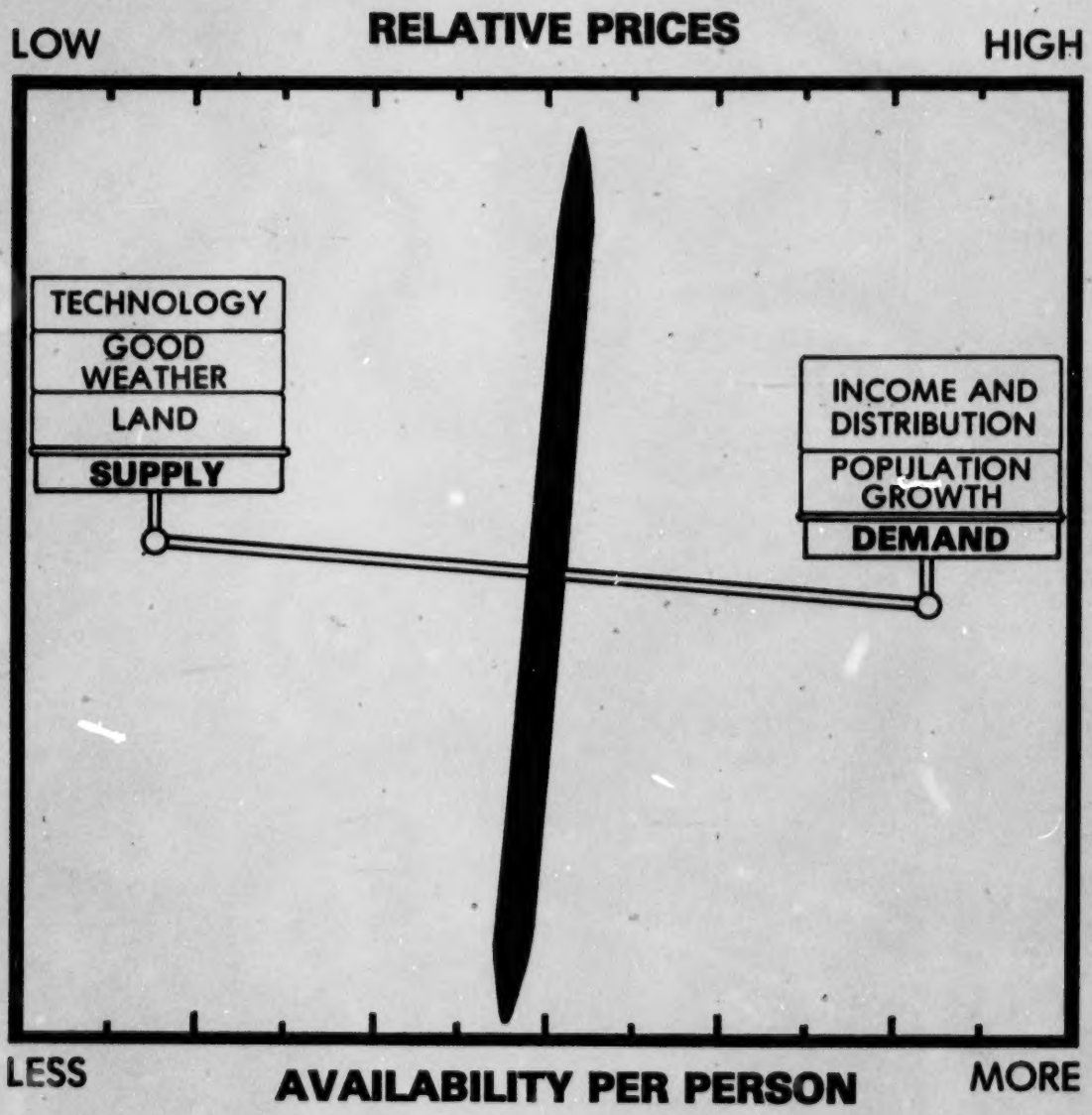
3. Simply providing food aid does not insure that the food reaches its intended consumer because of the food distribution problems in many of the developing countries.

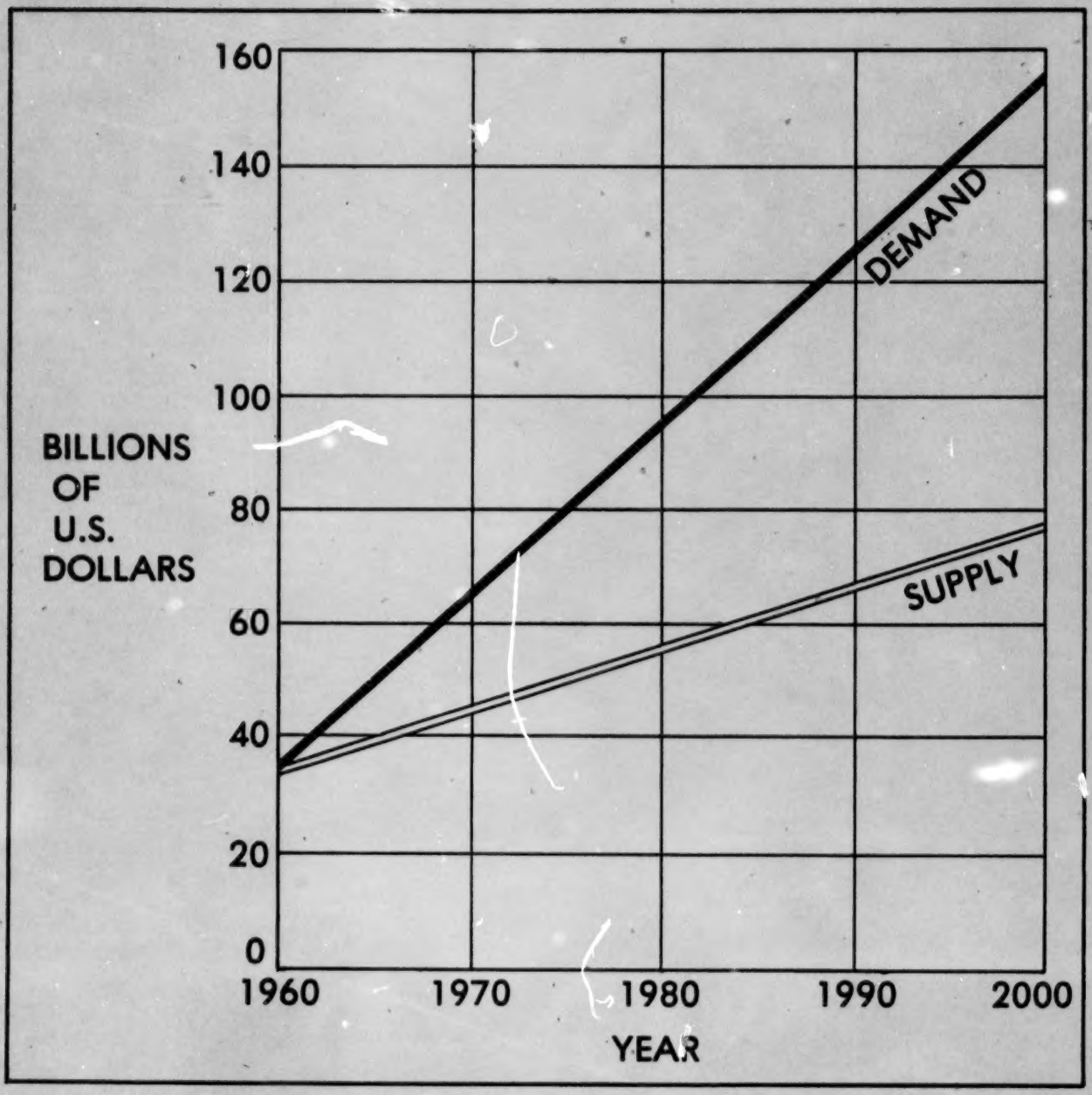
G. Technical aid would have to be within the abilities and resources of the small farmers in developing countries.

H. Population control is necessary even though by itself it cannot overcome the problems in the world food situation; there are many social and cultural problems to be overcome in the acceptance of population control.

I. New technology and research will help to further increase food production.

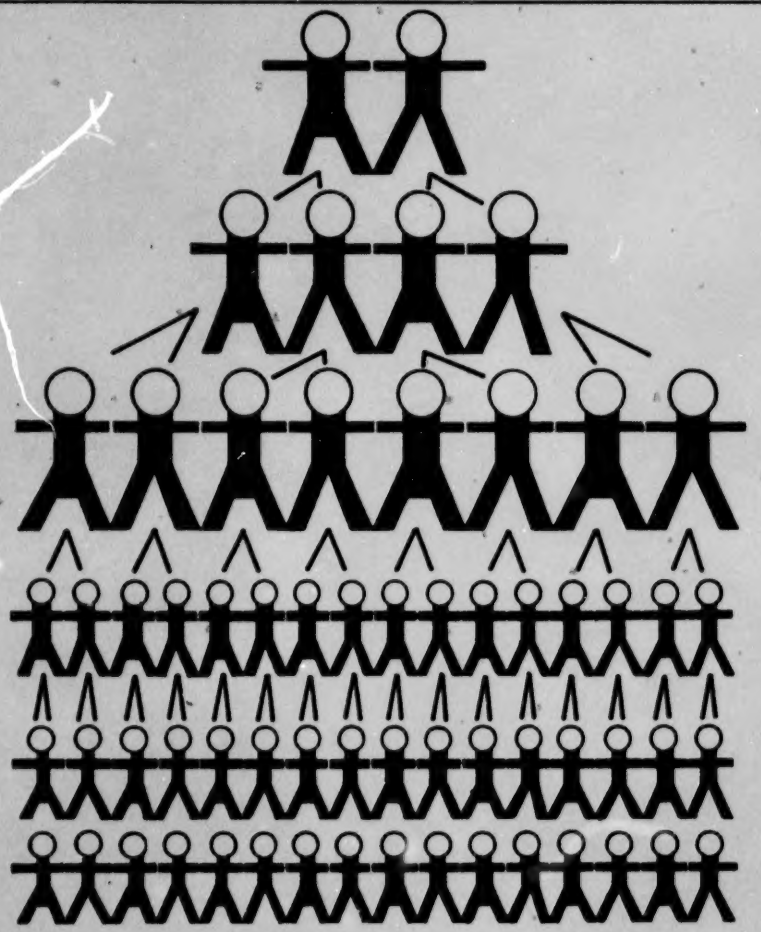
FOOD SUPPLY-DEMAND BALANCE

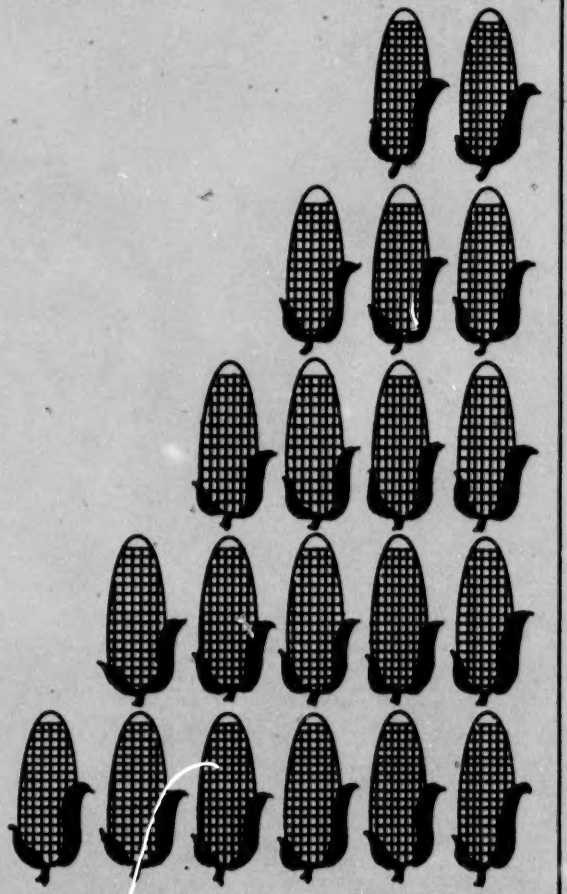



160
140
120
100
80
60
40
20
0
BILLIONS OF U.S. DOLLARS
DEMAND
SUPPLY
1960
1970
1980
1990
2000
YEAR

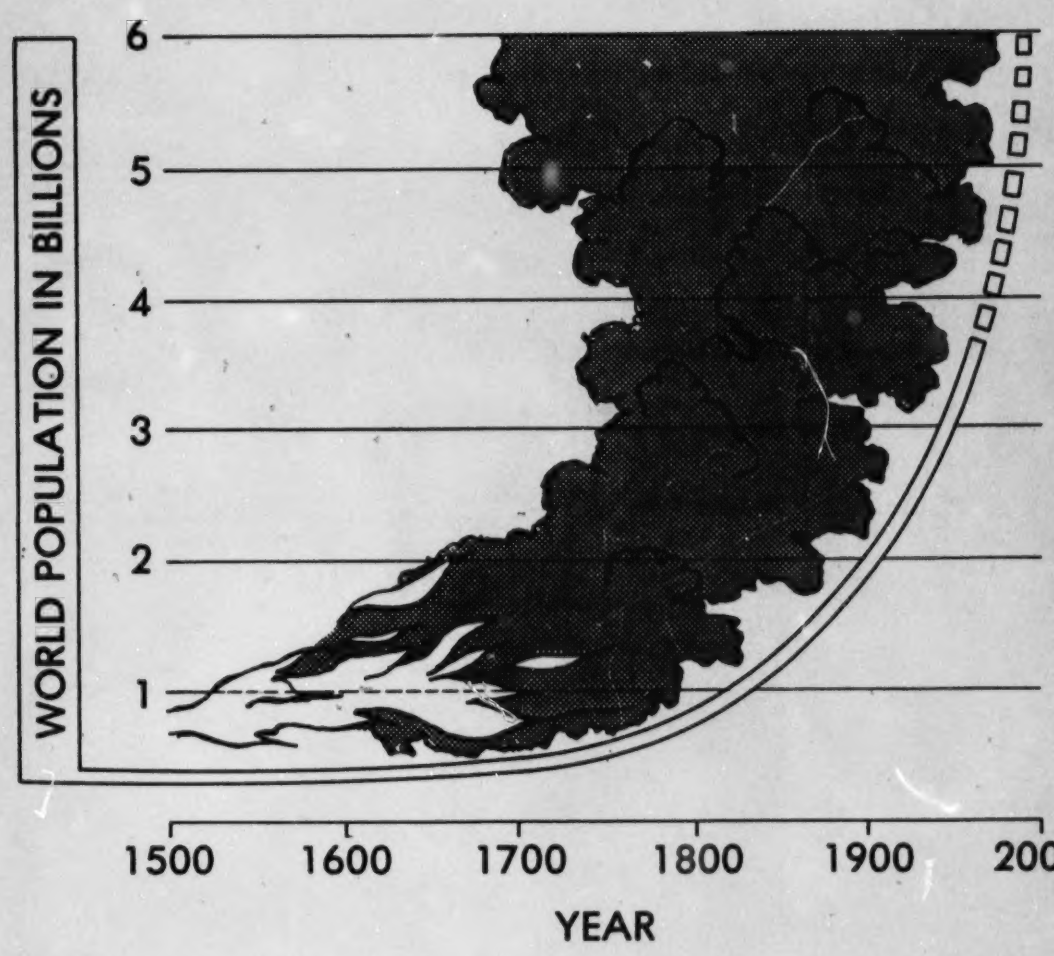
Malthusian Theory of Population

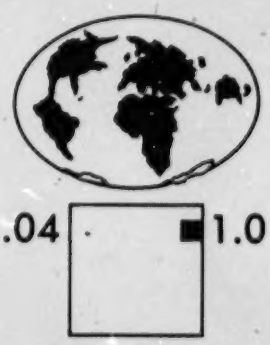
POPULATION INCREASES GEOMETRICALLY	FOOD INCREASES ARITHMETICALLY
2	2
4	3
8	4
16	5
32	6



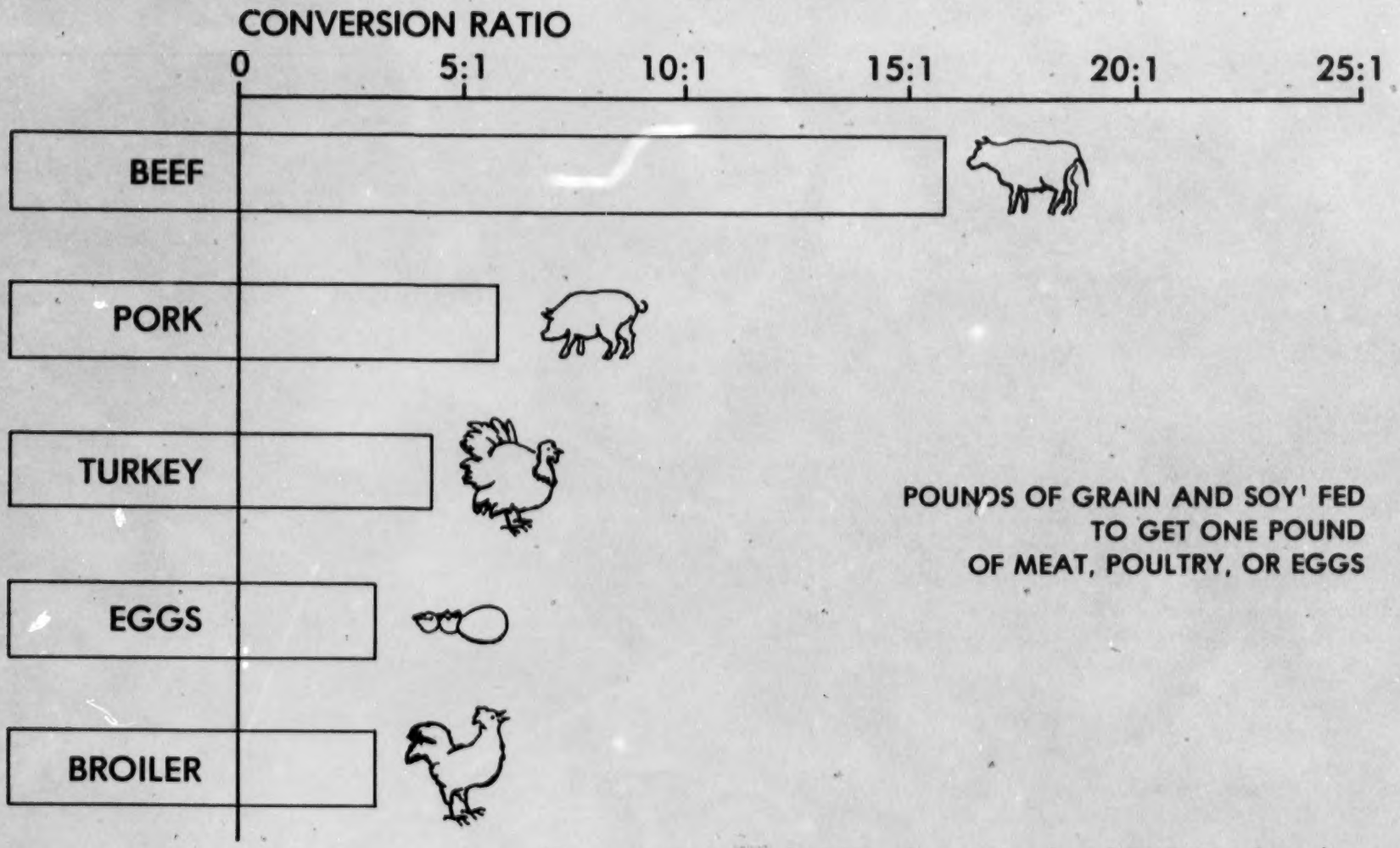


The "Population Explosion"



Years Ago and Cultural Stage	Area Populated and Assumed Density per Square Kilometer	Total Population millions
1,000,000 LOWER PALEOLITHIC		.125
6,000 VILLAGE FARMING AND EARLY URBAN		86.5
210 FARMING AND INDUSTRIAL		728
A.D. 2,000 FARMING AND INDUSTRIAL		6,270

Grain Protein Conversion of Livestock

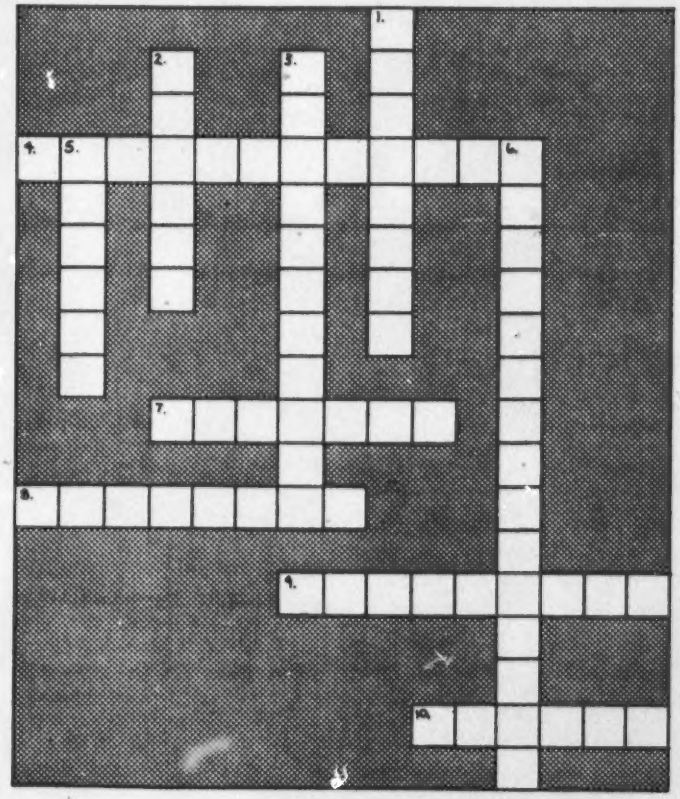


POUNDS OF GRAIN AND SOY[1] FED
TO GET ONE POUND
OF MEAT, POULTRY, OR EGGS

[1]Soy constitutes only 12% of steer feed and 20-25% of poultry.

ASSIGNMENT SHEET #1: NUTRITIONAL DEFICIENCIES AND DISEASES

Directions: Write the word or term in the matching blanks on the puzzle form which best completes the thought or matches the description.



ACROSS

4. A softening of bones in adults caused from a deficiency of vitamin D or calcium or phosphorus.

7. A lack of vitamin D or insufficient exposure to sunlight causing bowed legs and other defective bone growth in children.

8. A deficiency of thiamine causing damage to nervous tissue; occurs primarily where white rice is almost the only food in the diet.

9. The most severe damage resulting from xerophthalmia and the deficiency of vitamin A.

10. A swelling of the thyroid gland caused primarily from a lack of iodine.

DOWN

1. Partial starvation or chronic deficiency of calories.

2. The blood becomes deficient in red corpuscles or hemoglobin usually resulting from a lack of iron.

3. A severe protein-calorie malnutrition which is one of the greatest threats to the good health of the world's children.

5. A deficiency of vitamin C resulting in bleeding under the skin and in the gums.

6. A lack of riboflavin resulting in tissue changes of the mouth and around the nose.

CAN THE WORLD FEED US?

ASSIGNMENT SHEET #2: WORD SEARCH

Directions: The following is a word search puzzle designed to help you become familiar with factors influencing the world food situation. The descriptions or hints below will help you in locating the terms. Locate the words on the puzzle and circle the term. Remember words may appear horizontally, vertically or diagonally.

1. The most important factor influencing the world food situation
2. The greatest impacts on food production in any one area (2)
3. Malthusian theory shows how population grows in _____ progression while food supplies increase in _____ progressions. (2)
4. Necessary for modern agricultural productions (3)
5. Transportation, storage and processing of food.
6. Countries which have the fastest-growing populations
7. An important raw material in chemicals for modern agricultural production
8. A Malthusian term for restraints or checks of population growth including starvation, disease and war
9. Many farmers in developing countries lack these for modern agricultural food production. (2)
10. A basic difference or inequality between developed and developing countries

I M K G R B E Q D J P F K R L
A E D C D E V E L O P I N G A
A B C L I M A T E K B D A E R
R K J L B A C K M N W P O O R
I P E T R O L E U M D N C M N
T E K I I P W P N Q H A E E A
H M F R B G E O C C B T Q T F
M P O P U L A T I O N U F R N
E E V D A E T K B W L R D I B
T S R J I F H G D X C A B C D
I T A H E T E C H N O L O G Y
C I D S N A R E S O U R C E S
N C A P I T A L K B D N Z C B
O I F E R T I L I Z E R B S C
P D C E L T C S U D Z H D F J
O E I K N O W L E D G E A C B
M S D I S T R I B U T I O N K

CAN THE WORLD FEED US?

ASSIGNMENT SHEET #3: INTERPRETING POPULATION FIGURES

Materials Needed:

Population figures of U.S. or world from standard reference book such as encyclopedia, geographical dictionary, geography or social studies text.

List of the recent populations of the largest cities in the U.S.

Population figures for your city or town.

Suggested Activity:

1. Look up the latest population figures for the United States, or world if they are available, from a standard reference from the school or public library. Record the findings below:

   date of information: _____

   area covered: _____

   population figures given: _____

   source of information: _____

2. Multiply the figure by 2 percent, which is the average rate of increase in the world population. Record your answer below:

   increased number of people in a year: _____

3. Refer to a list of the population of the largest cities in the U.S. Which city has the population nearest the size of the yearly increase in population? What is the difference in the yearly increase in population and the size of the city? Record your answers below:

   city: _____

   differences in size: _____

4. Divide the yearly population increase by the population of your city or town. Record your answer below:

   your city/town: _____

5. Write below your reactions to the assignment sheet. Include how your idea or concept of a 2 percent yearly growth in population has changed.

Hand your assignment sheet in to the teacher.

ASSIGNMENT SHEET #4: CLASS WORLD FOOD CONFERENCE PROJECT

1. Divide the class into groups of 5 or 6, depending upon the size of the class.

2. Students should review information sheet and study the world food situation.

3. Students are to role play delegates at a class world food conference. Delegates should represent both developed and developing countries. Preparation and support for positions they assume or issues presented will be necessary.

4. Students are to plan the topics that will be presented and select a delegate or representative to appropriately present the topic. The group should plan the agenda for the conference including topic or issue, length of presentation and delegate or representative responsible for presentation. Record the agenda on the following page.

5. The students should present the conference to the class and role play the delegates or representatives with the planned agenda.

6. The students not presenting are to record notes and list all of the solutions or recommendations presented. Record those on the following page.

7. The total class is to vote on the solutions or recommendations in order of importance.

8. Turn the agenda and record of recommendations and solutions in to the instructor.

Record planned agenda here:

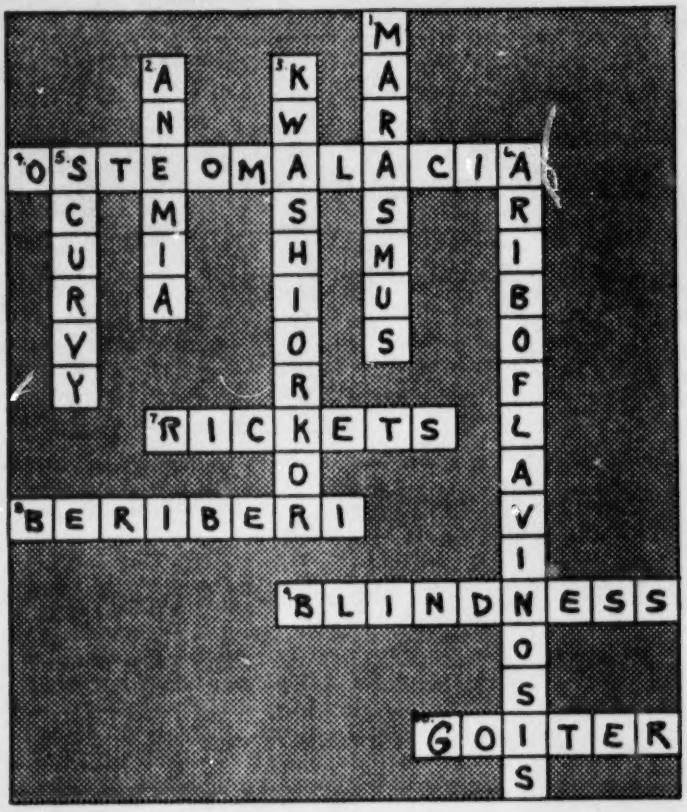
Topic or issue	Delegate to present

Record the recommendations or suggestions presented here:

CAN THE WORLD FEED US?

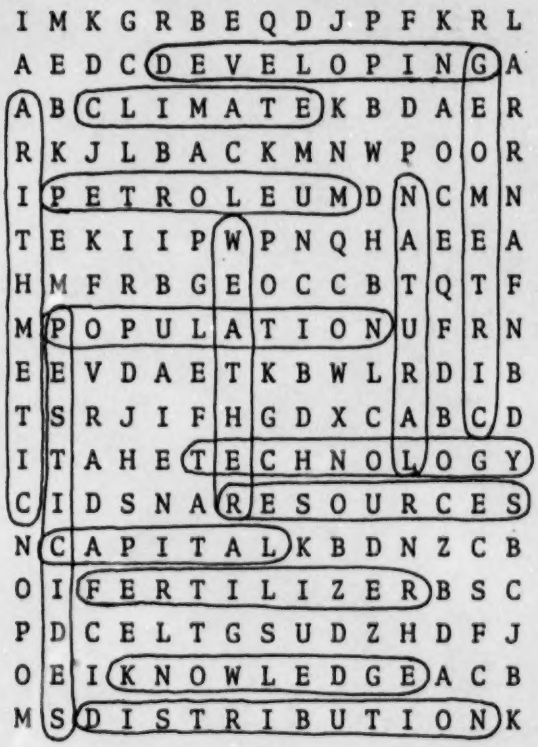
ANSWERS TO ASSIGNMENT SHEETS

Assignment Sheet #1



Assignment Sheet #2

1. Population
2. Weather, Climate
3. Geometric, Arithmetic
4. Fertilizer, Pesticides, Technology
5. Distribution
6. Developing
7. Petroleum
8. Natural
9. Capital, Knowledge
10. Resources


I M K G R B E Q D J P F K R L
A E D C D E V E L O P I N G A
A B C L I M A T E K B D A E R
R K J L B A C K M N W P O O R
I P E T R O L E U M D N C M N
T E K I I P W P N Q H A E E A
H M F R B G E O C C B T Q T F
M P O P U L A T I O N U F R N
E E V D A E T K B W L R D I B
T S R J I F H G D X C A B C D
I T A H E T E C H N O L O G Y
C I D S N A R E S O U R C E S
N C A P I T A L K B D N Z C B
O I F E R T I L I Z E R B S C
P D C E L T G S U D Z H D F J
O E I K N O W L E D G E A C B
M S D I S T R I B U T I O N K

Assignment Sheet #3

Completed to the satisfaction of the instructor.

Assignment Sheet #4

Completed to the satisfaction of the instructor.

47

Name _____

Class _____

Score _____

CAN THE WORLD FEED US?

UNIT TEST

Matching: Place the letter of the term or disease in the space to the left of the number which best matches the description or definition.

	DEFINITIONS	TERMS
____ 1.	The application of science to achieve industrial and commercial objectives.	A. Agrarian
____ 2.	The inadequacy of the nutritional quality of the diet and deficiency of certain nutrients.	B. Developed countries
____ 3.	The vital and social conditions of births, deaths and diseases.	C. Developing countries
____ 4.	Contagious and infectious diseases that are epidemic and fatal.	D. Demographic
____ 5.	Areas with little industry, technology and economic growth.	E. Famine
____ 6.	A period of scarcity and widespread or extreme shortages of food.	F. Hunger
____ 7.	System for deciding rationally who will be saved when it is clear that not everyone can be saved.	G. Malnutrition
____ 8.	The human condition of misery, suffering and pain caused from the prolonged lack of food.	H. Population control
____ 9.	Inadequate absorption of nutrients into body systems.	I. Pestilence
____10.	Efforts to lower the birthrate.	J. Technology
		K. Triage
		L. Undernutrition

DESCRIPTIONS		DISEASES
____11.	Caused by a deficiency in thiamine which affects the nervous tissues and is prevalent where white rice is about the only food eaten.	A. Anemia
____12.	The blood becomes deficient in red corpuscles or hemoglobin caused primarily from a lack of iron and high-quality protein in the diet.	B. Scurvy
____13.	A swelling of the thyroid gland caused from a lack of iodine in the diet.	C. Rickets
____14.	In adults this softening of the bones is caused from a lack of vitamin D or calcium and phosphorus.	D. Pellagra
____15.	The deficiency of vitamin C resulting in bleeding of the gums and under the skin.	E. Marasmus
____16.	Occurring primarily where people use corn as a staple in the diet, this niacin deficiency causes skin eruptions and digestive and nervous disturbances.	F. Beriberi
____17.	Partial starvation caused from a chronic lack of calories resulting in a shriveled face.	G. Kwashiorkor
____18.	A drying of the eye membranes which can ultimately lead to blindness caused from a deficiency of vitamin A.	H. Osteomalacia
____19.	Occurring primarily in children, a defective bone growth and bowed legs caused from a lack of vitamin D and sunlight.	I. Ariboflavinosis
____20.	A severe form of protein-calorie malnutrition which is one of the greatest threats to the good health of the world's children.	J. Zerophthalmia
		K. Goiter

Name _____

21-23. Briefly trace famine in history in a short paragraph including the first known famine, one of the most well-known famines and at least one famine that has occurred in the last few years.

24-26. Briefly list three ways in which famines differ from periods of scarcity.

a.

b.

c.

27-33. Briefly describe in one sentence each seven effects of hunger on humans.

a.

b.

c.

d.

e.

f.

g.

34-36. List in one sentence each the three arguments presented by those who favor vegetarianism as a means of meeting world demands for food.

a.

b.

c.

37-40. List in one sentence each the four arguments presented by those who favor livestock production as a means of meeting world demands for food.

a.

b.

c.

d.

41-43. Briefly describe in a short paragraph three changing situations in the United States and other developed countries that affect the world food situation.

Name _____

44-46. Briefly describe in a short paragraph three problems in developing countries that affect the world food situation.

47-49. Briefly define the Malthusian theory of population including its two major points.

50-54. In a short paragraph identify five means of improving the world food situation.

55-69. In a short essay discuss the five major factors causing the current world food situation, including at least two more specific points under each of the major factors.

ANSWERS TO TEST

1. J
2. G
3. D
4. I
5. C
6. E
7. K
8. F
9. L
10. H
11. F
12. A
13. K
14. H
15. B
16. D
17. E
18. J
19. C
20. G

21-23. The answer should include the following points as presented on the Information Sheet section II on famine in history.

a. The earliest written reference to famine occurred in 3500 B.C. in Egypt.

b. The "Potato Famine" in Ireland in 1846-51 is one of the most well-known famines.

c. Famines resulting from civil wars have occurred in the last few years. (One of the following should be noted.)

1) Several hundred thousand people died of starvation in Biafra in 1969-70 during the Nigerian Civil War.
2) During the Pakistani Civil War, resulting in the establishment of Bangladesh, thousands died from disease and starvation.
3) In the summer of 1974, several thousand people died in West Africa and Ethiopia from famine caused from several years of drought.

24-26. The answer should include the following differences as presented on the Information Sheet section III on the differences in famines and periods of scarcity.

a. A famine is a general, acute or extreme shortage of food within a region or particular geographic locale which is not relieved because of inadequate distribution or imports of food supplies.

b. Famines cause mass starvation, disease and deaths.

c. Famines are usually sudden, with sharp reduction in the food supply.

27-33. The answer should include seven sentences similar in content to those presented on the Information Sheet section IV on the effects of hunger as:

a. The failure to grow normally or thrive is a sensitive indicator of undernourishment in children.

b. Body composition changes during hunger; there is a loss of fat and protein from the body, an accumulation of water, and bones become more fragile.

c. Fertility does not appear to be impaired or reduced by undernutrition but the babies of undernourished mothers generally are smaller in size.

d. Hunger lessens the work capacity or physical strength and endurance.

e. Hunger increases the susceptibility and occurrence of infection and disease.

f. Hunger causes changes in social behavior and personality adjustment with increased depression and other serious personality disorders.

g. Hunger adversely affects mental development.

1) Maternal malnutrition can limit both the number and size of the child's brain cells.
2) Since the brain and nervous system achieve approximately 80 percent of the total growth in the first four years of life, malnutrition can seriously inhibit normal mental development.

34-36. The answer should include three basic arguments as presented in the Information Sheet section X on the grain for food vs. feed issues. (Refer to the Information Sheet for the more specific points under each.)

a. Larger numbers of people can be fed if a given quantity of grain is eaten directly by humans than if it is fed to livestock.

b. It is less efficient to feed grain to animals and then use livestock products for human food than it is to feed grain to humans directly.

c. A vegetarian diet can be a healthy diet, although it requires careful planning and an in-depth knowledge of nutrition.

37-40. The answer should include four basic arguments as presented on the Information Sheet section X on the grain for food vs. feed issues. (Refer to the Information Sheet for the more specific points under each.)

a. Livestock can utilize vast areas of grazing lands where high-yield crops cannot be grown.

b. Poultry and livestock, especially the ruminants, consume fibrous feeds (roughages), wastes and byproducts for food which would not be suitable for human consumption and otherwise wasted.

c. Plant and animal roles in world agriculture are traditionally complementary and interdependent.

d. Animal food is of high nutritional quality, provides needed nutrients and is an efficient means of improving human diets.

41-43. The paragraph should include any three of the following basic points of the changing situations in the United States and other developed countries that affect the world food situation as presented on the Information Sheet section VIII. (Refer to the Information Sheet for the more specific points under each.)

a. In the past, imbalances between food production and a rapidly growing population in the developing countries had been largely met by huge imports from the large stockpiles in the U. S.

b. Stockpiles were depleted in 1972-1973 when the crops failed in many major countries.

c. Several other factors within the U. S. have placed an increased demand on U. S. food production, including sharp decreases in the farm population with increases in the non-farm or urban population.

d. Agriculture plays a central role in the economy and is sensitive to changes in the economy and prices.

44-46. The paragraph should include any three of the following basic points of the changing situations in the developing countries that affect the world food situation as presented on the Information Sheet section IX. (Refer to the Information Sheet for the more specific points under each.)

a. Rapid population growth is the greatest problem in developing countries.

b. Increasing production by technological advances is a complicated and slow process because it requires diffusion of knowledge and training, plus technology that is suitable to the land and climate.

c. Some additional land can be made available for production by improving land and water resources such as land clearing, leveling, drainage, irrigation and flood control.

d. The majority of the farmers in the developing countries are small farmers who need limited technology that is within their resources and ability to apply and manage.

47-49. The answer should include a definition of the Malthusian theory of population growth similar to that presented in the Information Sheet section VII and any two of the following major points of the theory.

a. Malthus believed the world population tended to increase faster than the food supply, thus keeping the bulk of the population on the verge of starvation or subsistence.

1) He showed that unrestrained population growth increased in geometric proportion or progressions or 2 to 4 to 8 to 16 to 32, etc.
2) He also indicated that the food supply increased in arithmetic progression from 2 to 3 to 4 to 5 to 6, etc.
3) He pointed out two sets of checks or restraints that control the population, including the natural checks of starvation, disease and war and the positive restraints of celibacy, late marriage and birth control.

50-54. The paragraph should include any five of the following basic points for solving the world food situation as presented in the Information Sheet section XI. (Refer to the Information Sheet for the more specific points under each.)

a. Protein in the diet can be increased or supplemented.

b. High-yield and hearty varieties of grains can be developed and grown in many parts of the world.

c. Production of animal species such as beef and dairy cattle and sheep, which can be fed roughages and other humanly inedible foods could be increased.

d. The use of manure for fertilizer could be increased.

e. Foods from the sea can be cultivated.

f. Food aid offers some limited help.

g. Technical aid would have to be within the abilities and resources of the small farmers in developing countries.

h. Population control is necessary even though by itself it cannot overcome the problems in the world food situation; there are many social and cultural problems to overcome in the acceptance of population control.

i. New technology and research will help to further increase food production.

55-69. The essay should discuss the five major factors causing the current world food situation and should include at least two more specific points under each of the five major factors as presented in the Information Sheet section VI. (Refer to the Information Sheet for the more specific points.)

a. The population variable is perhaps the most important factor influencing the world food situation.

1) Population growth continues to increase at a faster rate than food production, straining the capacity of the world to provide adequate food supplies.
2) In 1975, the world population was growing by about 2 percent each year, which is about twice the rate it was in 1950.
3) Although in developing countries the proportion of undernourished population has declined, the absolute number of hungry people has increased.
4) Population growth also contributes to the increasing levels of pollution and excessive crowding.

b. Weather and climatic changes probably have the greatest impact on food production in any one region or area.

1) Climate is unpredictable, thus requiring large reserve stocks of food to provide safety from crop failure due to weather.
2) The problem of the effect of climate and weather on the world's food supply has two aspects, including the possibility of long-range changes and the uncertainty of year-to-year variations causing shifts in crop production locally or regionally.

3) Some meteorologists speculate that there are long-range changes in the world's climate, weather and rainfall that could affect food production.
4) Modern agricultural methods, which produce the bulk of the world's food supply, are more vulnerable to weather changes and extremes for several reasons.

c. Agricultural production is affected by the availability of fertilizers, pesticides and technological developments.

1) Chemical fertilizers and pesticides can be used to increase the food production and their use has increased approximately fivefold from 1970-1972.
2) Chemical fertilizers and pesticides may not be the best solution since they are made from large quantities of petroleum products and their prices have increased drastically due to the short supplies and the energy crisis.
3) Irrigation, mechanization and new agricultural methods are other technical improvements that can affect food production.
4) Higher food prices result from increases in the cost of production and transportation.
5) The availability of low-priced fertilizer was a critical element in the Green Revolution.
6) Chemical fertilizers require large amounts of water to increase food production effectively and moisture is limited in many areas where food supplies are the most critically limited.

d. There is an inequitable distribution of resources in the world, including the resources of food and the resources needed to produce food.

1) Many of the technological advances which can increase food production require investments of large and expensive equipment, costly petroleum products and knowledge and skill to operate.
2) Food and petroleum are examples of economic resources used in world trade and exchange. A country's economy and development can be harmed if the balance of payments is upset by imports that are more costly than income from exports.

e. There are many challenges to be overcome in distributing large stocks of food from producers to the areas of the world where it is needed.

1) Food distribution systems, including the facilities that are needed for transportation, storing, processing and distributing to the people, are still inadequate in many of the developing countries.

2) Technology and facilities are needed for proper storage, transportation and distribution of food imports so that the food does not spoil before it reaches its intended consumer.
3) In some areas it has been reported that rats eat up to 30 percent of the food, and other reports indicate almost total rotting of grain on ships due to improper storage.
4) Storage and transportation of food adds to its cost; for example, storing grain adds an additional 10 to 15 percent to its market cost or value.